DETAILS, continued

VI. FINDINGS, continued

A. 1, i., continued

other part of the FSAR was found to identify the "elevation" at which the "lower compaction level...could be used".

See Findings A.1.h. above. for reference to Figure 2.5-533.

The Figure 2.5-584 does not reflect information applicable to the Concern.

j. FSAR Section 2.5.5.4, "Compaction Specifications" states:

"The compaction specification for earth and rock fills are discussed in Section 2.5.4.5.1.3 and 2.5.4.5.2. respectively.

No Section "2.5.4.5.2.2" for "rock fills" was found in the FSAR. Section 2.5.4.5.2.1 (See Finding A.1.c) is the only identified subsection of section 2.5.4.5.2, "Granular Fill".

2. Construction Specifications:

The General Construction Specifications G-9 and T-1 are the only specifications found to have been referenced and issued for backfill construction activities at WBNP.

No project construction specification was found to be issued, eventhough Specification G-9 indicates that project specifications will be issued for "special work" and "special considerations".

Specification G-9 does not apply to granular type materials, since it only addresses "rolled earthfill" type construction. The 1075 material is not addressed in this specification.

Specification T-1 provides "Material specifications" for granular materials, such as "Section 1075", but does not

DETAILS, continued

VI. FINDINGS, continued

A. 2, continued

specify the installation of such material for Trench B type construction. The "Material Specifications" for the "Section 1075" does not specifically delineate the use of this material, however, the title "Crushed Stone for Switchyard Surfacing" and the gradation requirements do not reflect a material which is intended to be used for compacted backfill in lieu of Class A or A1 earthfill.

a. General Construction Specification G-9 prescribes materials, methods and controls for earthfill for dams and power plants. The specification is principally issued for dams. For power plants, such as WBNP, the specification states that "applicable portions shall be used." However, the specification does not clearly identify which "portions" are "applicable" to power plants.

The specification applies to "rolled earthfill", not granular fill, and states that "Separate construction specifications for the project will be issued by ENDES to cover special work not included in this specification." Accordingly, the 1075 granular material used for Trench B is not addressed in this specification.

b. General construction specification T-1, Section 4.0, "Materials Specifications" is referenced in the design drawings (see Finding A.3) and other project documents for materials designation.

Section 1075 is titled "Crushed Stone for Switchyard Surfacing". This section does not specify the intended use of this 1075 material, however, the title and gradation reflect a material intended for drainage purposes.

The "Bottom Layer (same as ASTM D448, size 56)" gradation requirements of Subsection 1075.3 are stated as:

DETAILS, continued

VI. FINDINGS, continued

A. 2, b. continued

Square Sieve Size	% by weight Passing
1-1/2 Inches.....	100
1-inch.....	90-100
3/4-inch.....	40-75
1/2-inch.....	15-35
3/8-inch.....	0-15
No.4.....	0-5

3. Design Drawings:

The design drawings, specifically 10N213-1 and 10N213-2, issued for construction of the Underground Barriers (Trench A&B) state that the "backfill is Category I" and shall be in accordance with Specification G-9. Specification G-9 does not address the 1075 material; see Findings A.2.

The drawings permit the use of 1075 for the bottom layer (12 inches minimum) to establish a working surface on top of the existing shale, for depths 25 to 40-ft below final grade, and for backfilling below and around the CCW Blowdown line which crosses the Trench B. However, the drawings do not specify that 1075 may be used as a substitute for the required Class/Type A or A1 earthfill materials.

The drawings specify three different provisions for compaction of 1075 for Trench B. Two provisions state the lift thickness and number of passes. One of the provisions, for below the CCW Blowdown line, states the 1075 is to be "compacted as reasonable as possible, in the inspectors judgement."

The drawings do not specify whether or not the 1075 material is subject to inplace testing for construction control, as indicated in the FSAR for granular fill; see Findings A.1.b for FSAR statements.

DETAILS, continued

VI. FINDINGS, continued

A. 3. continued

The drawings indicate that "verbal (oral) instructions" will be provided in "cases" where appropriate quality standards are not specified or included in the design documents.

Other drawings, such as 10N224-1, show that the 1075 material is specified for use in "French Drains" as a filter material.

The following detail findings supplement the above general findings:

a. Drawing 10N213-1, "General Notes" state:

"1. Backfill is Category 1 and the quality assurance required is defined in the following notes and on Dwg. 10N213-2.
2. All construction shall be in accordance with General Construction Specification G-9, except as noted."

The "Note 1" statement that the "backfill is Category 1", equates to Seismic Category I or safety-related.

The "Note 2" reference to "Specification G-9" does not apply to granular material such as the 1075; see Findings A.2.

b. Drawing 10N213-1, Sections A1-A1 & C1-C1, shows cross-sections of Trench B. These section show 12 inches of granular material for the bottom layer, from the top of the "sound, unweathered rock" to the top of "weathered shale". The sections refer to "Note 1 of Backfill" (Drawing 10N213-2) for the granular material. The balance of the depth of the Trench is shown as "backfill". The "Backfill Notes" heading on Drawing 10N213-2 was changed to read "Earthfill Notes".

DETAILS, continued

VI. FINDINGS, continued

A. 3 continued

c. Drawing 10N213-2, "Earthfill Notes", Note 1 states:

"Place and compact a minimum of 12 inches of granular material meeting the requirements of Section 1075 (bottom layer) of General Construction Specification F-1. The following gradation is also acceptable.

Square Sieve Size	Percent Passing by Weight
1-1/2 Inches	100
3/4 Inch	30-75
3/8 Inch	5-15
No. 4	0-5

The granular material shall be placed in maximum 10 inch loose lifts and compacted with a minimum of 5 complete passes by a Dynapac C125 vibratory roller or an ENDES approved equal."

The "minimum of 12 inches" of 1075 material provides a "working surface" or "interface", as described in the FSAR; see Finding A.1.e.

This "Note 1" does not specify in-place testing of the material, and does not reflect usage "in lieu of earthfill".

d. Drawing 10N213-2 (Revision 6), "Earthfill Notes", Note 4(c) of "Earthfill Placement Instructions" states:

"Trench b: Earth placement instructions for Trench B are a function of the depth from final grade to the datum.

DETAILS, continued

VI. FINDINGS, continued

A. 3, d, continued

(1) For 25 feet or less: Type A1 earthfill shall be placed from the granular 1075 material to within 8 feet of final grade. The remainder of the Trench shall be type A earthfill.

(2) For a depth greater than 25 feet but less than 40 feet: granular material meeting the requirements of Earthfill Note 1 shall be placed to within 25 feet of final grade. Type A1 earthfill shall be placed from a depth of 25 feet to 8 feet. The remainder of the trench shall be Type A earthfill.

(3) For a depth greater than 40 feet or for cases of unusual excavation geometry, contact the geology and geotechnical engineering group in CEB for instructions. Such cases will be evaluated on an individual basis and verbal instructions provided to the field."

All three of the depth conditions were found to apply to Trench B; see Findings A.5.

The "(2)" condition, and possibly the "(3)" condition, permits the use of 1075 material in lieu of Type A1 earthfill. The reference to "Note 1" does not provide for inplace testing of the 1075 material.

The "(3)" condition permits "verbal (oral) instructions", which were not found to be documented or prescribed. The "unusual excavation geometry" was not found to be documented or otherwise defined.

The above Note 4(c) is not shown on Revision 2 of the Drawing, which is Figure 2.5-581 in FSAR; see Findings A.1.f and A.,8.c.

e. Drawing 10N213-2 (Revision 6), "Earthfill Notes", Note 6(c) of "Exceptions and Substitutions..." states:

DETAILS, continued

VI. FINDINGS, continued

A. 3. e. continued

"For backfilling below and around the CCW Blowdown Line, material meeting the gradation requirements of Earthfill Note 1 may be used. The material shall be placed in maximum 6 inch loose lifts and compacted as follows:

"Directly below the pipe the granular material shall be compacted as reasonable as possible, in the inspectors judgement, using small plate compactors (wacker) from both sides. Where small vibratory rollers (Bomag BW80) can be operated, in the inspectors judgement, a minimum of 6 to 8 passes shall be made."

The Note 6(c) terms, "around," "below" and "directly below", do not adequately define the extent of permitted use of the 1075 material. The CCW Blowdown Line diagonally crosses the Trench B, at points more than 100-ft apart, which could encompass 100 or more lineal feet of the Trench, at depths less than 25-ft below final grade. This is a significant "exception" to Note 4(c), above.

The Note 6(c) does not indicate that 1075 material is to be placed on top of Type A1 earthfill; see Findings A.5.

The Note 6(c) permits some of the 1075 to be "compacted as reasonable as possible" or "6 to 8 passes" using "small vibratory rollers", based on the "inspectors judgement" in lieu of the "Note 1" requirements for compaction.

The Note 6(c) does not specify that the 1075 material is to be tested for inplace density or other compaction related properties, as indicated in the FSAR for construction control of granular fill materials; see Findings A.1.b.

DETAILS, continued

VI. FINDINGS, continued

A. 3. e. continued

The Note 6(c) is not shown in FSAR Figure 2.5-581; see Findings A.1.f and A.6.c.

f. Drawing 3.N224-1, Section C1-C1, shows "French Drains" at the IPS Sheet Pile walls. The material specified for these drains is "Filter Material Spec T1, Sect 1075", which is the 1075 material specified for Trench B backfill on the drawings identified above.

4. Quality Control Procedure:

Quality Control Procedure WBNP-QCP-2.06 was found to apply to granular type material used for backfill. The procedure neither specifically includes, nor generally excludes, the 1075 material used for Trench B. The procedure indicates that such granular material will be tested in-place for compaction and that test results will be documented. For the 1075 material used for Trench B, the documentation shows no in-place tests were conducted.

The procedure contains references and definitions that do not adequately describe important activities. Generally, the procedure does not adequately prescribe the control and documentation activities for safety-related, compacted, granular backfill.

The following detail findings supplement the above general findings:

a. Section 1.0 and 2.0, "Purpose" and "Scope", state:

"This procedure specifies the methods used to control and document granular fill placement."

"This procedure applies to all permanent granular material placed and compacted."

The "Purpose" statement does not include the term "compaction", as an adjunct to "placement", however,

DETAILS, continued

VI. FINDINGS, continued

A. 4. a, continued

the "Scope" does state "placed and compacted". The 1075 material used for Trench B is encompassed by the "all permanent granular material" statement.

b. Section 3.0, "References", contains reference 3.2 which is General Construction Specification G-9, "Rolled Earthfill for Dams and Power Plants".

Specification G-9 does not cover compaction and control of granular backfill materials; see Findings A.2. Reference to the specification in this procedure appears to be applicable for only the generation and transmittal of records or reports (see Section 8.2 of the procedure, and Section 12.0 of the Specification.)

The procedure does not specifically refer to Specification G-9 for frequency of testing, as indicated in the FSAR; see Findings A.1.b.

c. Section 4.0 contains the following "Definitions":

"Backfill - Material used in refilling open or structure excavations that cannot be placed until after completion of additional construction events."

"Crushed Stone - Well-graded crushed stone suitable for backfill or that complies with the provisions of reference 3.1."

"Sand - Material which is generally smaller than the number 4 sieve and similar to section 4 of reference 3.3."

Reference "3.1" is Specification T-1 and reference "3.3" is ASTM C33 for concrete aggregates.

DETAILS, continued

VI. FINDINGS, continued

A. 4. continued

The "Backfill" definition encompasses both granular and non-granular, such as earthfill, materials. The definition does not reflect compacted granular material only.

The terms "backfill" and "fill" are used in the procedure.

The "Crushed Stone" definition appears to include two types: (1) those that are "well-graded" and "suitable for backfill", and (2) those that comply with Specification T-1.

The term "crushed stone" is used in the procedure (Attachment C and D) in conjunction with "1032" type material only.

The terms "granular" and "surge" are used in the procedure, but are not defined.

The procedure does not contain any specific reference to 1075 material, and does not exclude this material generally.

d. Section 6.4. "Tests", subsection 6.4.2 states:

"Perform compaction density and moisture tests and verify they are acceptable. Perform at least one test each day during backfill placement where 100 cubic yards or more of material is being placed and at least one test on each 1,000 cubic yards of fill. Perform more frequent tests if specified by ENDES or if directed by the Materials Engineer."

This section states that in-place tests will be performed. The procedure does not exclude the 1075 material specified for Trench B. However, such tests were not found to have been performed; see Findings A.6.

DETAILS, continued

VI. FINDINGS, continued

A. 4., continued

e. Section 6.4, "Tests", subsection 6.4.3 states:

"Record tests for compaction density, and moisture on attachments A, B or I as applicable.

Tests were not found to be recorded. The Backfill Daily Reports (Attachment A of this procedure) were found to show "N/A" for such tests; see Findings A.6.

f. Section 7.1 of "Acceptance Criteria" states:

"Except where noted on ENDES drawing and the following, the basis for the acceptance criteria for granular fill placement are reference 3.1 and 3.2."

Reference "3.1" is General Construction Specification T-1, which does not address the "acceptance criteria" noted in the subsections of Section 7.0; see Findings A.2.

Reference "3.2" is General Construction Specification G-9, which does not apply to granular materials; see Findings A.2.

Reference to the above specifications for "acceptance criteria for granular fill placement" is not justified and is misleading.

g. Section 7.1.4 of "Acceptance Criteria" states:

"Compaction, moisture, and density test are conducted in accordance with references 3.4, 3.5, and 3.6. Except where noted on ENDES drawings or ENDES instructions, the layer thickness designed in this section is subject to change by authority of the Construction Engineer or his designed representative."

DETAILS, continued

VI. FINDINGS, continued

A. c. continued

References "3.4, 3.5 and 3.6" are ASTM standards for in-place testing methods.

This section indicates that compaction, moisture, and density tests are to be conducted. The drawings for Trench B are not "noted" otherwise for the 1075 material: see Findings A.3. However, such tests were not found to have been conducted; See Findings A.6.

h. Section 8.0, "Documentation", subsection 8.1 states:

"Granulated Fill placement activities are indexed in the Granular Fill Tracking System (sample printout, Attachment A) by identification number, date placed, daily report number, section(s), type material placed, and representative sample number(s)."

The "Granular Fill Tracking System" printout, dated 1/31/84, was found to show 1075 as a "type of material placed" for Trench B (Section 29, which includes Trench A&B). However, for the "representative sample number(s)" for the 1075, the entry was "NA" for all cases. The Backfill Daily Report numbers were shown on the printout; see Findings A.6.

5. "As-built Cross-Sections" for Trench B:

The "as-built cross-sections" for Trench B show that 1075 granular material was installed as a bottom layer over shale. This bottom layer varies in thickness from approximately 2-ft to 17-ft. The "sections" show that the 1075 material was installed to a thickness of 8-ft on top of Type A1 fill (thickness to 8-ft) at Stations 2+50 to 3+50, which corresponds to the location of the CCW Blowdown Line. The "sections" show 1075 material to be less than 25-ft below final grade at stations 3+100 and 3+50.

DETAILS, continued

VI. FINDINGS, continued

A. 5. continued

The "cross-sections" show Trench B depths of less than 25-ft to more than 40-ft below final grade.

These "as-built cross-sections" were prepared by DED, based on DGC surveying data, in conjunction with Note 4 on Drawing 10N213-1. These "sections" are not signed, dated or identified as a QA Record.

The following detail findings supplement the above general findings:

a. Sections at Stations 0+31 through 2+00 show that 1075 was placed to depths of 14-ft to 17-ft, as a bottom layer, and is more than 25-ft below final grade.

The Trench B depth is shown to be in the 35-ft to 45-ft range for these stations.

The Station 0+31 and 0+50 sections show a special notation for "1075 rock placed in sump around standpipe."

b. Sections at Stations 2+50 through 3+50 show that up to 4-ft of 1075 was placed as a bottom layer, then up to 8-ft of Type A1 was placed, and then up to 8-ft of 1075 was placed on top of Type A1 earthfill.

The placement of 1075 on top of the Type A1 was apparently done in conjunction with the Drawing 10N213-2, Note 6(c); see Finding A.3.e. This condition is inconsistent with the WBNP FSAR, Section 2.5.4.5.1.3 (Page 2.5-117) and Section 2.5.4.5.2.1 (Page 2.5-119); see Findings A.1.a and A.1.c.

The Sections do not show the existing DDW Blowdown piping, which diagonally crosses through the Trench B backfill, at these Stations.

DETAILS, continued

VI. FINDINGS, continued

A. 5. b. continued

At Station 2+50, the trench depth is shown to exceed 40-ft. The depth at the other stations is shown to be in the 25-ft to 40-ft range.

At Stations 3+00 and 3+50, the top layer of 1075 is shown to be less than 25-ft below grade, contrary to Note 4(c) on Drawing 10N213-2; see Finding A.3.c.

c. Sections at Stations 4+00 through 6+50 show that 1075 was placed to a thickness of up to 2-ft.

The trench depth is shown to be less than 25-ft at these stations.

6. Backfill Daily Reports:

Backfill Daily Reports for Trench B show that 1075 material was installed, and was compacted to the extent prescribed in Drawing 10N213-2, Earthfill Notes (see Findings A.3). The reports indicate that more than 1,400 truckloads of the 1075 material used for the south portion (station 0+00 to 4+00) of Trench B, and that the material was placed during the periods of November to December 1983 and late February to April 1984. The Backfill Daily Reports show that the 1075 material was not tested inplace for density or compaction, contrary to WBNP-QCP-2.06 and the WBNP FSAR; see Findings A.1.b and A.4.

The following detail findings are based on Backfill Daily Reports for Section 29 (Trench B portion, only) and granular fill (1075 only):

a. Reports 83-186 (11-3-83) and 83-187 (11-7-83) show placement of 100 truck loads for Station 2+50 to 4+00.

DETAILS, continued

VI. FINDINGS, continued

A. 6. continued

b. Seventeen (17) Reports, from 83-194 (11-19-83) to 83-227 (12-20-83) show placement of more than 600 truck loads for Station 0+00 to 2+00, and an additional 150 truck loads to Station 3+00.

c. Nine (9) Reports, from 84-036 (2-28-84) to 84-048 (3-9-84), show over 300 truck loads for Station 1+20 to 3+75.

d. Other Reports, from 84-063 (4-1-84) to 84-100 (5-16-84), show over 250 truck loads for Station 0+00 to 4+00.

e. The "weather" notations on the above Reports, in general, reflect some "cold" or "cool" temperatures, but do not reflect snow or icy conditions for the placements. The Reports do not indicate that water was used to achieve compaction or density.

f. All of the above Reports show "N/A" for Test Data, indicating that inplace testing was not performed for the 1075 material, contrary to procedure WBNP-QCP-2.06 (see Findings A.4) and the WBNP FSAR (See Finding A.1.b).

7. Personnel Statements:

QE and CONST personnel stated that the 1075 material was used for Trench B backfill to a greater extent than originally planned. Personnel stated that the 1075 was used in lieu of Class A or A1 earthfill to facilitate placement during the winter season.

CONST personnel stated that inplace testing was not performed for the 1075 material. Personnel could not identify any documented instruction to deviate from the Quality Control Procedure WBNP-QCP-2.06 provision for such testing of granular backfill (see Findings A.4), but stated that a verbal (oral) instruction may have been given by QE personnel.

DETAILS, continued

VI. FINDINGS, continued

A. 7. continued

CONST/ACE and AGM personnel stated that the WBNP-QCP-2.06 was not intended to apply to 1075 material, and that the Design Drawings for Trench B are interpreted as not requiring inplace testing of the material.

8. TVA Letter to US NRC:

The TVA Letter to US NRC (L44850116809), dated 1-16-85, transmits "information concerning the as-built configuration of the underground barrier" (Trenches A&B) at WBNP for NRC review. This Letter states:

"This submittal completes TVA action related to resolution of NRC concerns with respect to mitigation of adverse affects due to potentially liquefiable soil along the...ERCW pipeline".

The Letter contains information regarding the use of 1075 material in Trench B. The information provides a better perspective than described in the WBNP FSAR, but does not reflect all aspects of the design drawing provisions and as-built conditions for the Underground Barriers, specifically regarding the 1075 material.

a. The "Enclosure", second page, second paragraph, states (in part):

"...since the construction period for the trench B barrier extended through a winter season, the option to use crushed stone in lieu of earthfill was selected to expedite completion of construction."

The "crushed stone" is not specifically identified as 1075 material.

DETAILS, continued

VI. FINDINGS, continued

A. 8, continued

b. The "Enclosure", second page, fifth paragraph, states:

"Figures 13 through 16 are representative cross-sections along the centerline of Trench B. Since trench B was backfilled with compacted crushed stone in addition to earthfill, additional potential failure planes were identified at the various material interfaces and analyzed. The stability summary on figure 3 provides the results on two of these potential failure planes. The first, at the top of weathered shale (A), is provided for each section. The second, at one of the other potential failure planes, represents the lowest factor-of-safety for that cross-section other than at the top of the weathered shale. Figures 17 through 21 provide the summaries of inplace density and moisture quality control tests conducted on the fill materials during construction of trench B."

The "Figures 13 through 16" are not representative of the varied uses of 1075 material in Trench B; see Findings 8.e, below.

The reference to "compacted crushed stone" is not specifically identified as 1075 material.

The "Figures 17 through 21" show "inplace density and moisture quality control tests" results for earthfill and 1032 crushed stone, but not for the 1075 material.

c. "Figure 2" is identified as Drawing 10N213-2, Revision 2.

The Figure does not reflect the substantial changes, specifically regarding use of 1075 material, in the current, Revision 6 (dated 5-18-84) to Drawing 10N213-2.

DETAILS, continued

VI. FINDINGS, continued

A. B. c. continued

The Drawing "Backfill", which was changed to "Earthfill", Notes 4(c) and 6(c) are not shown on the Figure. These notes permit use of 1075 material for Trench 3 to a much greater extent than reflected in Note 1. See findings A.3 of this Report for the Notes shown on Revision 6 to the Drawing.

d. "Figure 3" is a "Stability Analysis Summary".

The Figure is similar to the WBNP FSAR Figure 2.5-583 (see findings A.1), but reflects significant changes.

The "Underground Barrier Analysis Summary" shows a new set of "Safety Factors" and "Notes" for Trench B. The FSAR Note 6, indicating a "thick section of 1075 material" is not shown. The new notes do refer to "interface between 1075 crushed stone", but the Figure does not reflect the extent of use of the material.

e. "Figures 13 through 16" show as-built cross-sectons for Trench B at Stations 1+00, 2+50, 3+00 and 4+50, respectively. These Figures are essentially the same as the corresponding "As-built Cross-Sections" referenced in Findings A.5 of this Report, but are not representative of all the sections for Trench B.

The Figures do not represent:

(1) Stations 0+31 and 0+50, which have 1075 material in sump around standpipe at east side of Trench.

(2) Stations 1+50 and 2+00, which have compaction test results of 86.6% to 93.0% and 90.4% to 92.5%, respectively, for fill in the 100% compaction zone.

DETAILS, continued

VI. FINDINGS, continued

A. B. e. continued

The Figures do provide a better perspective of the use of 1075 material in Trench B than reflected in the WBNP FSAR. The Figures do not show any compaction test numbers or results for the 1075 material. The figures do not show the CCW Blowdown piping that penetrates the barrier at Stations 2+50 and 3+00.

B. Second Aspect of the Concern:

The following findings relate to the aspect of the Concern regarding a Tie-In or Cut-Off feature in the area between the southerly end of Trench B and the southwesterly face of the IPS sheet pile wall:

1. Final Safety Analysis Report (FSAR)

The WBNP FSAR indicates that the backfill in the IPS area is Class "A" backfill. The boundaries are from finish grade to "sound rock", and from the IPS sheet pile wall to 100-ft outward, which would be into the boundary of Trench B. These boundaries are reflected in the FSAR drawings (Figures), but not the design drawings issued for construction.

a. FSAR Figure 2.5-225 (Drawing 10W335), "Excavation and Backfill, Category I Structures, Sheet 1", shows the "limits of Class A' backfill" around the IPS and sheet pile wall. The "limits" are shown pictorially, but do not have dimensions or coordinates and do not indicate if the limit is at finished grade or at base of structure. This drawing is labeled "not a construction drawing".

By scaling the drawing, the Class "A" backfill should extend approximately 100-ft out from the sheet pile wall at the center. Accordingly, the backfill around the IPS sheet pile wall should extend into the excavation and backfill for Trench B, i.e., should tie the Trench backfill into the backfill at the IPS structures, without additional excavation.

DETAILS, continued

VI. FINDINGS, continued

B. 1, continued

b. FSAR Figure 2.5-226a (Drawing 10W337), "Excavation and Backfill, Category I Structures, Sheet 3", Section B3-B3 shows the backfill on the exterior of the IPS and sheet pile wall to be "Class 'A' Backfill (TYP)" placed on "sound rock". This drawing is labeled "not a construction drawing".

c. FSAR Section 2.5.4.5.1.3, page 2.5-116, states:

"At Watts Bar Nuclear Plant, Class A backfill is placed around all Category I structures. This material, which is selected earth placed in not more than 6-inch layers, has a minimum required compaction of 95 percent of the maximum standard density at optimum moisture content. Class A1 backfill used in portions of the underground carrier trenches has the same requirements except it has a minimum required compaction of 100 percent of maximum dry density of optimum moisture content."

"The fill used to form the channel slopes in the intake channel is composed of material originally excavated from the intake channel. The material is compacted to 95 percent of maximum density at optimum moisture content."

2. Design Drawings for Backfill Around Building Walls:

The design drawings issued for construction of backfill around building walls, in general, indicate that Type/Class A is required. No exception was found for the IPS or IPS sheet pile walls. These documents do not show the specific limits or boundaries of backfill around the IPS, and do not identify a Tie-In or Cut-Off feature as being required.

a. Drawing 10N210, "General Grading Plan," Note 5 states:

DETAILS, continued

VI. FINDINGS, continued

B. 3, a. continued

This Note is the only written instruction which was found to address a Cut-Off feature. However, this Note does not specify a mandatory requirement to "assure adequate cutoff," as demonstrated by the use of the term "may". The Note is dependent on "verbal" (oral) instruction.

b. Personnel stated that no written documentation was issued or received regarding the "verbal instruction" that was given and received per "Note A1"; see Findings B.7.

4. "As-Built Cross-Sections" for Trench B:

The "as-built cross-sections" of excavation and backfill for Trench B do not show additional excavation and backfill from Trench B, toward to IPS sheet pile wall.

The sections at Station 0+31, 0+50 and 1+00 only show that portion of the work that is within the boundary of Trench B, as shown on the Design Drawings.

These "as-built cross-sections" were prepared by CEU, based on CQC surveying data, in conjunction with Note 4 on Drawing 10N213-1. These "sections" are not signed, dated or identified as a QA Record.

5. Backfill Daily Reports and Other Documentation for IPS:

Backfill Daily Reports and project photographs indicate that the initial backfill around the exterior of the southwest side of the IPS and sheet pile wall was installed during the period of March 15 to May 17, 1976, and that earthfill was the type of backfill material used. However, neither the Backfill Daily Reports nor any other documentation for backfill of this area for this period identifies the specific extent or boundaries of the fill placed.

a. WBNP Project Photograph No. 85P784, dated 3/15/76, shows the open excavation around the structure, and Photograph No. 85P826, dated 5/17/76, shows the backfill inplace.

DETAILS, continued

VI. FINDINGS, continued

B. 5. continued

b. The Granular Fill Tracking System (WBNP-QCP-2.06) list, dated 1/31/84, shows that granular material (1075) was used on 4/14/76 (Report 76-232) and 5/20/76 (Report 76-279) for the Section 6 (IPS). Backfill Daily Reports 76-232 and 76-279 show that 1075 stone was used for drains only.

c. The Earthfill Fill Tracking System (WBNP-QCP-2.01) list, dated 1/18/84, shows that earthfill was used for the Section 40 (IPS) during the period of 4/7/76 to 4/27/76.

Backfill Daily Reports, such as 76-064 and 76-080, indicate that earthfill was placed and compacted in accordance with the specifications for Class "A" backfill.

d. CONST personnel stated that the 1976 backfill was placed down to the shale, and that no questionable in-situ materials were left inplace for this work.

e. CEU and CQC personnel could not locate any surveying data (field books) for the extent of excavation around the IPS structures.

6. Backfill Daily Report for Trench B:

One Backfill Daily Report indicates that a "Cut-Off" feature (trench) was excavated and backfilled from Trench B towards the IPS sheet pile wall, in 1984 in conjunction with Trench B construction. The "Cut-Off" is identified as being between Stations 0+30 and 0+95 of Trench B, and from Trench B towards the IPS sheet pile wall. The backfill materials used for this trench are reportedly the same as for the south end of Trench B; see Findings A of this Report.

DETAILS, continued

VI. FINDINGS, continued

B. 6. continued

a. Backfill Daily Report 84-063 (WBNP-UCP-2.06, Granular), dated 4/3/84, for Section 29 (Trench B) shows "Sta. 0+30 to Sta. 0+95 (in cut-off) to sheetpile" for location of fill. This is the only Report that was found to reference the "Cut-Off". This Report shows that 1075 stone was placed in 8 to 10 inch layers and compacted by 7 to 8 roller passes.

b. The "as-built cross-sections" for Trench B (see Findings A.5 of this Report), specifically at Stations 0+31, 0+50 and 0+100, do not show the "Cut-Off" excavation and backfill boundaries.

7. Personnel Statements:

QE and CONST personnel stated that a Tie-In or Cut-Off feature was partially installed in conjunction with the excavation and backfill of Trench B. This Partial-Tie-In or Partial-Cut-Off was described as being incomplete because the additional excavation of a trench from Trench B toward the IPS Sheet Pile wall did not extend to shale and into compacted backfill at the IPS, and because some of the questionable (liquefaction potential) in-situ materials were encountered but not completely removed.

Personnel stated that the Partial-Tie-In trench was approximately 50-ft wide, at bottom of excavation, and was excavated to within 15 to 20 feet (at final grade) of the IPS Sheet Pile Wall.

Personnel stated that the extent of the questionable in-situ materials left in-place was not determined, but was estimated to be from 2 to 5 feet in depth and width, and of wedge shape.

DETAILS, continued

VI. FINDINGS, continued

B. 7. Continued

Personnel stated that backfill materials used for this additional excavation were the same as for Trench B; see Findings A for use of 10/5 material.

Personnel stated that verbal (oral) instructions, regarding the excavation and backfill for Partial-Tie-In, were not shown to have been documented: see Findings B.3.a.

DE Personnel stated that the in-situ materials in question and left in-place are acceptable with regard to the intent for the "Underground Barriers for Potential Soil Liquefaction": see Findings B.9.

Personnel stated that the Tie-In or Cut-Off feature, or the area between Trench B and IPS, was not discussed with or identified to any US NRC personnel with regard to Potential Soil Liquefaction.

8. TVA Letter to US NRC:

The TVA Letter to US NRC (L44850116809), dated 1/16/85, transmits "information concerning the as-built configuration of the underground barrier" (Trenches A&B) at WBNP for NRC review. This Letter states that "This submittal completes TVA action related to resolution of NRC concerns with respect to mitigation of adverse affects due to potentially liquefiable soil along the...ERCW pipeline."

The Letter, and the attachments, do not identify additional excavation from the Trenches towards the IPS Sheet Pile Wall, in conjunction with Note A1 of Drawing 10N213-1 for the Underground Barriers.

a. "Figure 1" of the Letter is Drawing 10N213-1.

Note A1 of the Drawing and Figure refers to a "cutoff" between the Trenches and IPS Sheet Pile Walls; see Findings B.3 for related findings regarding this Note.

DETAILS, continued

VI. FINDINGS, continued

B. 8. continued

b. "Figure 4" of the letter shows a planview of as-built "excavation limits of underground barrier" (Trenches A & B).

For Trench B, the Figure shows some extension of the excavation at the south end of the trench. This additional excavation is towards the Intake Channel, as compared to the Sheet Pile Wall, and appears to be in conjunction with the dewatering sump and standpipe at that location.

For Trenches A & B, the Figure does not show the additional excavation from the Trenches toward the IPS Sheet Pile walls, in conjunction with Note A1 of Drawing 10N213-1 and "Figure 1" of the Letter.

9. TVA Memorandum:

TVA Memorandum (CEB 830801020), DE/CEB (H.R.Threlkeld) to CEB Files, dated 8/1/83, describes the results of a "Field Inspection" of the Underground Barrier work in progress on July 22, 1983.

The Memorandum, page 3, first paragraph, states:

"The cutoff section at the end of trench A next to the intake pumping station was being excavated but had not been completed when we left the site. The cutoff section is necessary to assure that there is not a flow path for the potentially liquefiable sands to escape from behind the barrier. Per our verbal instruction, the cutoff is being cut closer to the sheetpile retaining wall than the 50 feet shown on drawing 10N213-1. The toe of the excavation will be approximately 30+ feet from the sheetpile wall, but will stand only 12 to 15 feet in height. This should be stable for the short time this part of the excavation is open."

DETAILS, continued

VI. FINDINGS, continued

B. 9. continued

The above statement is for Trench A, but appears to be equally applicable for Trench B regarding the necessity for a "cutoff section.. to assure that there is not a flow path from the potentially liquefiable sands to escape from behind the barrier." Note that "verbal instruction" was given regarding the "cutoff" construction.

C. Third Aspect of the Concern:

The following findings relate to the aspect of the Concern regarding the underground water seepage/percolation at the surface point located on the slope to the Intake Channel, between the Trench B and IPS Sheet Pile Wall:

1. Final Safety Analysis Report (FSAR):

The WBNP FSAR was not found to specifically address the condition reflected in the Concern. The following sections of the FSAR were reviewed for related information:

a. Section 2.5.4, "Stability of Subsurface Materials".

b. Section 2.5.5, "Stability of Slopes".

c. Section 2.5.6, "Embankments." which states:

"There are no embankments at the site which are used for plant flood protection or for impounding cooling water required for the operation of the nuclear power plant"

2. Specifications:

General Construction Specification G-9 addresses "springs" and "slope protection", however, these provisions are not clearly identified as being

DETAILS, continued

II. FINDINGS, continued

C. 2, continued

applicable for "power plant" earthfill features. The specification principally addresses "earthfill dams", and indicates that separate project specifications will be issued for "special work" and "special considerations". No separate project specifications were found to have been issued for WBNP for special earthwork or the condition reflected in the Concern.

General Construction Specification T-1 was not found to address the condition in any respect.

See Findings A.2 for related findings regarding Specifications G-9 and T-1.

a. Specification G-9, section 4.8, "Springs", first paragraph, states:

"Wherever there is flowing water or seepage on the prepared foundation of the dam, provisions shall be made to control the water so that it will not interfere with earthfill placing and will not become a later danger to the dam. All springs shall be brought to the attention of the Engineer. The Engineer will normally require that a spring be cut off with a program of grouting. This applies especially if the spring has a large flow or is located within or upstream of a designed foundation cutoff area if there is one, or otherwise is located within the upstream half of the dam."

b. Specification G-9, section 9.4, "Slope Protection", first paragraph, states:

"The faces of the dam will normally be protected against damage from wave action by rock riprap, and where not riprapped, against erosion from rainfall

DETAILS, continued

VI. FINDINGS, continued

C. 2. b. continued

by grass or other approved vegetative ground cover. When other types of slope protection are to be used, their requirements will be given on the drawings or in separate construction specifications for the project. Slope protecting shall be applied at the locations and within the limits shown on the drawings."

3. Design Drawings:

The design drawings, issued for construction related to the condition identified in Concern, were not found to clearly provide for evaluation and resolution of the condition.

a. Drawing 10N210, "General Grading Plan, Main Plant", Note d.o states:

"If an underground spring is encountered, crushed rock meeting the requirements of Section 1075 of General Construction Specification T-1 is to be used. The material is to be placed in 6 to 9 inch lifts and a standpipe is to be installed."

The above Note applies when a "spring" is encountered at the base of an excavation, prior to backfill. Therefore, even if the seepage/percolation in the Concern was found to be an "underground spring", the above Note does not specifically address the condition identified in the Concern.

b. Drawing 10N215, "Grading Plan, Intake Channel", Notes state:

"1. The Intake Channel shall be excavated to firm gravel and to the construction slopes shown on the typical section. The earth shall be stockpiled and replaced as rolled earthfill to the finished slopes. Earthfill placing

DETAILS, continued

VI. FINDINGS, continued

C. 3. b. continued

shall be in accordance with all applicable portions of General Construction Specification No.G-9 for rolled earthfill for dams and power plants. Compaction shall be a minimum of 95 percent of maximum standard density, and moisture content shall be maintained between 3 percent below optimum and 3 percent above optimum, all as determined by the Central Soils Laboratory."

"2. All other construction shall be in accordance with highway specification T-1."

All disturbed areas above riprap shall be fertilized grass with type 7 seed mixture and mulched per section 180 & 182."

The above Notes apply to slopes for the Intake Channel, and the drawing does not clearly encompass the slope in question in the "limits of construction". However, if the slope in question was included, the Notes do not specifically address the condition identified in the Concern. See Findings C.2 for the Specifications referenced in Notes 1 & 2, above.

4. Procedures/Instructions:

Quality Control Procedure WBNP-QCP-2.01, for earthfill inspection and documentation, was not found to address the condition reflected in the concern. With the possible exception of Quality Control Instruction WBNP-QCI-1.02, for nonconforming conditions, no WBNP quality procedure or instruction was found to address the condition.

DETAILS, continued

VI. FINDINGS

C. continued

5. Documentation:

No project documentation, such as a Nonconforming Condition Report (NCR), Field Change Request (FCR) or memorandum, was found to identify or address the condition reflected in the concern.

6. Field Observation:

Field observation of the area revealed that there is a "hole" in the soil at the location described. The "hole", and erosion "rut" down the slope, indicate that water had previously seeped or percolated from underground to that surface point and flowed down the slope to the Intake Channel.

a. The "hole", as observed during this investigation, is located approximately 20-ft west of the west face of the IPS sheet pile wall, and approximately 50-ft north of the south end of the sheet pile wall, on the slope to the Intake Channel.

b. The "hole" was approximately 3-ft in depth and 1-ft in diameter. The "hole" did not appear to have been previously refilled or otherwise re-worked, but did have some granular (stone) material at the bottom.

c. An erosion "rut" was observed from the "hole", down the slope to the rip-rap for the Intake Channel. The "rut" had been previously deposited with soil on top of plastic sheet material. The depth of the "rut", prior to the refilling, appeared to be approximately 1-ft.

d. No other such holes or erosion was observed on the slope, between the IPS structures (west side) and the Concrete Gutter west of the IPS.

See Observations, Section VIII of this Report for erosion on the west side of concrete gutter and on the slopes west of the gutter.

DETAILS, continued

VI. FINDINGS, continued

C. continued

7. Personnel Statements:

DE and CONST personnel stated that they were aware of this seepage/percolation at the surface point on the slope southwest of the IPS. DE personnel stated that they have taken no documented action regarding the condition, since CONST had not requested such. CONST personnel stated that they had unsuccessfully attempted to identify the source of the flowing water, and have not requested from DE, or otherwise initiated, any corrective action to resolve the condition.

a. CONST/CEU personnel stated that tracer dye was placed in the Yard Drainage Holding Pond, the CCW Blowdown line, the ERCW Backwash line and the Trash Sluice line to determine if any of these features may have been the source of leakage. Onsite Norris Laboratory personnel tested the effluent water for the tracer dye, and the results were negative, according to the personnel statements. These tests and the results were not formally documented, and the file of personal notes could not be located during this investigation.

b. CONST/CEU personnel stated that DE personnel did visit the site and observed the surface seepage/percolation area, but no documented action was proposed or implemented.

c. DE personnel stated that they were aware of the condition, but would not take any documented action unless requested by CONST.

VII. CONCLUSIONS:

A. The Concern is substantiated.

B. For the Concern aspect regarding the use of 1075 granular material for backfill of Trench B (Underground Barrier), it is concluded that:

DETAILS, continued

VII. CONCLUSIONS, continued

B.

1. The 1075 material was used as backfill in Trench B, to depths of up to 17-ft at the south end. and to depths of 8-ft at the CCW Blowdown lines and on top of Type A1 earthfill. The use of this material as backfill is not adequately prescribed in the design drawings and described in the WBNP FSAR. The 1075 material is not prescribed in the Construction Specifications, or described in the WBNP FSAR, as a material suitable for use as compacted backfill or as a substitute for Class A backfill. To some extent, the 1075 material was installed on the basis of "verbal (oral) instructions"and "inspectors judgement", which were not prescribed design requirements and were not subsequently documented. The use of this material does not demonstrate appropriate implementation of measures established for selection and review of suitability of application of materials essential to the function of the structure.

2. The 1075 material, in lieu of compactible Class A or A1 earthfill or 1032 granular backfill, was used to expedite construction during the winter season.

3. The 1075 material was not subjected to in-place testing to maintain and verify control of compaction. In-place density, moisture, and relative density tests were not conducted and documented, contrary to construction control provisions for granular backfill as prescribed in WBNP-QCP-2.06 and described in the WBNP FSAR.

C. For the Concern aspect regarding the "gap" in backfill between Trench B and the IPS Sheet Pile Wall, it is concluded that:

1. The design drawing provision to "assure adequate cutoff of potentially liquefiable sands" was not adequately prescribed or implemented. The "gap" includes an undetermined quantity of questionable "sands" which were not removed in an unsuccessful attempt to tie-in the Trench B and IPS backfills.

DETAILS, continued

VII. CONCLUSIONS, continued

C. continued

2. The above described condition was not documented as a nonconforming condition, i.e., no NCR was issued, and the condition has not been identified to the US NRC for consideration of significance as a condition adverse to quality.

3. The use of 1075 material for backfill for the partial excavation (from French B to within 15 to 20 feet of the 125 Sheet Pile wall) is subject to the same anomalies identified in Conclusions B, above.

D. For the Concern aspect regarding the seepage/percolation of underground water at the surface of the slope between French B and the 125 Sheet Pile wall, it is concluded that:

1. The slope presently exhibits the condition of erosion from previous flow of water from underground to the surface. This condition has not been documented and reported as a deviation nonconformance, or condition needing corrective action..

2. The source and/or cause of the water flow from underground has not been identified and documented. No corrective action has been taken to preclude recurrence of the flowing, percolating or seeping underground water.

3. The potential for adverse affects of the flow of water on the stability of the slopes and subsurface materials has not been evaluated and documented.

E. The Concern, all three aspects, and this Report identify potentially significant conditions adverse to quality. These conditions, including evaluation of significance, determination of cause and affect, and remedial and preventative corrective action, have not been identified, documented, reported to appropriate levels of management, and addressed in a manner consistent with quality assurance program requirements for nuclear power plants.

DETAILS. continued

VII. CONCLUSIONS. continued

E. continued

The satisfactory performance of the Seismic Category I (safety-related) Essential Raw Cooling Water (ERCW) systems, specifically the underground piping and conduits subject to adverse affects of potential liquefaction of supporting soils, is dependent on the satisfactory performance of the underground Barriers (Trenches A and B) and stability of the associated slopes and subsurface materials.

The conditions identified in this report reflect nonconformance or deficiency in characteristic, documentation and procedure, which renders the quality of the Trench B and related soils structures unacceptable or indeterminate. This deficiency in design and/or construction, if left uncorrected, could adversely affect the safety of operations of WBNP, and represents a significant breakdown in a portion of the quality assurance program under 10CFR50, Appendix B.

VIII. OBSERVATIONS:

A. The following are observations of conditions not specifically identified in the Concern, but were revealed during this investigation and were found to be either contrary to quality assurance program requirements for nuclear power plants or inconsistent with good practice.

1. The WBNP Final Safety Analysis Report (FSAR) does not accurately describe the "as-built" condition of construction of the Category I Underground Barrierrs (Trenches A & B) for Potential Soil Liquefaction and the Class "A" backfill around the Category I Intake Pumping Station (IPS) and associated Sheet Pile wall.

FSAR Figures 2.5-225 and 2.5-226a show "limits of class 'A' backfill" around the IPS and Sheet Pile wall. However, these "limits" are not shown on design drawings issued for construction, and are not representative of the actual boundaries of installation of compacted backfill around the Category I structures.

DETAILS. continued

VIII. OBSERVATIONS. continued

A. 1 continued

FSAR Sections 2.5.4 and 2.5.5. as applicable. describe features of the Underground Barriers for Potential Soil Liquefaction. However. the FSAR does not identify the extent of use of granular material (such as 1075 and 1032 crushed stone) for backfill. does not identify the use of 1075 granular material in lieu of Class A or A1 backfill. and does not clearly identify 1075 material as being subject to or exempt from the construction controls described in FSAR Section 2.5.4.5.1.4.

2. General Construction Specifications G-9 and T-1 do not specify and include appropriate quality standards and design requirements for installation, inspection and testing of all materials used for Category I backfill at WBNP.

General Construction Specification G-9 is referenced in WBNP project documents, such as drawings. procedures and instructions, for installation, inspection and testing of granular fill materials. However, Specification G-9 does not specify or include provisions for such materials. The Specification addresses rolled earthfill and other materials, principally for dam construction, and does not clearly indicate the applicability for power plant earthwork.

General Construction Specification T-1 is also referenced in WBNP project documents for granular materials, such as Section 1032 and Section 1075. However. Specification T-1 provides material specifications only, and does not specify or include standards or requirements for the installation, inspection and testing of these materials for use as power plant backfill.

No project construction specifications were found to have been issued to specify and include appropriate quality standards and design requirements for granular backfill installation, inspection and testing at WBNP.

DETAILS, continued

VIII. OBSERVATIONS, continued

A. continued

3. Design Drawing 10N213-1 and 10N213-2, issued for construction of "Underground Barriers for Potential Soil Liquefaction", permit changes or deviations from design requirements and quality standards without identification, documentation, and control of such changes or deviations.

Drawing 10N213-1, "Note #1", and Drawing 10N213-2, "Earthfill Notes" 4(a) and 4(c)(3), permit the use of "verbal (oral) instructions" for activities within the scope of quality assurance. Personnel stated that such instructions were issued and implemented, and were not documented or otherwise identifiable or controlled.

4. The concrete gutter, located southwest of the Intake Pumping Station sheet pile wall, is not serving its intended function. The soil on the southwest side of the gutter has been eroded due to spillover of drainage from the discharge pipe at invert elevation 706. Refer to Drawings 10N234 and 10N215.

5. The upper slopes of the Intake Channel, above the riprap and southwest of Intake Pumping Station and concrete gutter, have significant conditions of erosion. The erosion of soil is progressive and appears to be due to surface water runoff and a lack of adequate slope protection. Refer to Drawing 10N215.

B. The above observations are presented in this Report for use in implementing additional investigation and/or corrective action, as appropriate, by the responsible organization(s).

PREPARED BY J. T. Nelson 1-11-86
DATE

REVIEWED BY O. H. Shaw 1/11/86
DATE

Reviewed & Accepted by Bruce F. Sieffert 1-28-86

ATTACHMENT A
IN-85-442-X13

CONCERN NO: IN-85-456-001 (MILESTONE 6)

CONCERN: C/I questioned the reason for the "Seismic Trench" across the intake structure. Concerned that during Seismic event the cooling water pipes could rupture and cut off the cooling water supply to the plant, both Unit 1 & 2.

INVESTIGATION
PERFORMED BY: J. T. Nation

DETAILS

This Concern is not substantiated.

The Concern was found to be only a question as to the purpose of the Underground Barriers (Trenches A and B) for Potential Soil Liquefaction below the Essential Raw Cooling Water (ERCW) pipelines.

The Concerned Individual (C/I) has been given an oral explanation, and will be provided with written information, regarding the purpose of the Underground Barriers.

This Concern is addressed in ERT Investigation Report No. IN-85-442-X13; refer to Clarification of Concern, Section V.B. of the Report.

ATTACHMENT B
IN-85-442-X13

CONCERN NO: IN-85-472-007 (Milestone 3)

CONCERN: Trench "B", south of the Intake Pumping Station, has developed an artesian well in the trench area. Trench was originally designed as a Seismic Barrier by order of the NRC and CI is concerned that erosion is occurring as a result of the water. TVA is aware of the problem but has failed to take any corrective measures.

INVESTIGATION
PERFORMED BY: J. T. Hatton

DETAILS

This Concern is substantiated.

This Concern involves the seepage or percolation of underground water at a point (hole) in the surface of the slope to the Intake Channel, between Trench B (Underground Barrier) and the westerly face of the Intake Pumping Station (IPS) Sheet Pile Wall.

This Concern is addressed in the ERT Investigation Report No. IN-85-442-X13: refer to Clarification of Concern, Section V.H, Third Aspect of the Concern in the Report.

ATTACHMENT C
IN-85-442-X13

CONCERN NO: IN-85-496-001 (Milestone 2)

CONCERN: ERCW Liquefaction, Underground Barrier-Trench B. Materials used to backfill-sequence. Type A fill to Type A fill tie at IPS (did not achieve) Drawing 10N213 applies.

INVESTIGATION
PERFORMED BY: J. T. Nation

DETAILS

This Concern is substantiated.

This Concern involves Trench B (Underground Barrier) and the 50-ft wide soil zone between the southerly end of Trench B and the westerly face of the Intake Pumping Station (IPS) sheet pile wall, as shown on Drawings 10N213-1 and -2. The Concern has two aspects:

1. The 1075 (stone) material used for backfill of Trench B and between Trench B and the IPS.

2. The lack (did not achieve) of a tie-in of the Trench B backfill, and the Class/Type A fill at the IPS.

This concern is addressed in ERt Investigation Report No. IN-85-442-X13; refer to Clarification of Concern, Section V.A. First and Second Aspect of the Concern in the Report.

REQUEST FOR REPORTABILITY EVALUATION

1. Request No. IN-85-442-X13 (ERT Concern No.) _____ (ID No., if reported)

2. Identification of Item Involved: ERCW System and related soils structures (Nomenclature, system, manuf., SN, Model, etc.)

3. Description of Proble (Attach related documents, photos, sketches, etc.)
Underground barriers and related soils structures, for protection of ERCW underground piping and conduit from adverse affects of potential liquefaction of underlying soils, are significantly deficient in Design and Construction.

4. Reason for Reportability: (Use supplemental sheets if necessary)

A. This design or construction deficiency, were it to have remained uncorrected, could have affected adversely the safety of operations of the nuclear power plant at any time throughout the expected lifetime of the plant.

No _____ Yes __X__ If Yes, Explain: Failure of the protective soils structures could adversely affect (settlement and rupture) the function of Seismic Category I (safety-related) ERCW Systems.

AND

B. This deficiency represents a significant breakdown in any portion of the quality assurance program conducted in accordance with the requirements of Appendix B.

No _____ Yes __X__ If Yes, Explain: Failure to control activities affecting quality, including failure to perform inspection/tests, identify nonconforming items, and implement corrective action. Criteria I, V, X, XI, XV, AND XVI.

OR

C. This deficiency represents a significant deficiency in final design as approved and released for construction such that the design does not conform to the criteria bases stated in the safety analysis report or construction permit.

No _____ Yes __X__ If Yes, Explain: Failure to specify and implement appropriate quality standards and design requirements for materials and for selection, installation and control of materials, which are essential to the function of the structure, as described in the WBNP FSAR.

OR

REQUEST FOR REPORTABILITY EVALUATION

D. This deficiency represents a significant deficiency in construction of or significant damage to a structure, system or component which will require extensive evaluation, extensive redesign, or extensive repair to meet the criteria and bases stated in the safety analysis report or construction permit or to otherwise establish the adequacy of the structure, system, or component to perform its intended safety function.
No _____ Yes __X__ If Yes, Explain: Extensive evaluation, repair, and/or modification will be required to establish the adequacy of the structure and/or system.

OR

E. This deficiency represents a significant deviation from the performance specifications which will require extensive evaluation, extensive redesign, or extensive repair to establish the adequacy of the structure, system, or component to perform its intended safety function.
No __X__ Yes _____ If Yes, Explain: _____

IF ITEM 4A, AND 4B OR 4C OR 4D OR 4E ARE MARKED "YES", IMMEDIATELY HAND-CARRY THIS REQUEST AND SUPPORTING DOCUMENTATION TO NSRS.

This Condition was Identified by: [signature] 365-4416
ERT Group Manager Phone Ext.

[signature] 4416
ERT Project Manager Phone Ext.

Acknowledgment of receipt by NSRS

[signature] Date 1-28-86 Time 07:15
Signed

ERT Form M

EMPLOYEE CONCERN ASSIGNMENT REQUEST

TO: Director - NSRS TRANSMITTAL NUMBER T50262

ERT has received the Employee concern identified below, and has assigned the indicated category and priority:

Priority: 1 Concern #IN-85-672-004

I-85-244-WBN

Category: 12 Confidentiality:___Yes____No(I&H)

Supervisor Notified:__X_Yes____No Nuclear Safety Related_YES_

Concern: REPLACEMENT HANGERS OFTEN DIFFER FROM THE ORIGINAL. SOME HANGERS ARE REMOVED BUT NOT REPLACED; DEPENDING ON THE ENGINEER. CI DECLINED TO PROVIDE FURTHER INFORMATION.

Replace hangers

1-29/86

Manager, ERT Date

NSRS has assigned responsibility for investigation of the above concern to:

ERT_____

NSRS/ERT_____

NSRS___✓___

OTHERS (SPECIFY)_____

Hangers Install

1-30-86

NSRS Date

ITEM	RESP. ORG.	ACTION	SCHEDULE
1240.08	OE/EAM/ PDM	Determine ASME code requirements and installation requirements for compression fittings and provide draft revision of G-29 for review.	12/03/85 (Complete)
1240.09	OE/EAM/ PDM	Issue revision to G-29 specification to include correct installation and re-make instructions and necessary inspection requirements for compression fittings. (IP - W M Stone to review).	Complete
1240.10	NP/JHF	Issue revision to DPM N73M2 to incorporate changes in G-29 spec regarding compression fittings.	Complete
1240.11A	OC/TRB	Revise and submit to P & T unit OC procedures to include instructions for installation, re-make, and inspection of compression fittings.	01/10/86
1240.11B	OC/TWH	Issue OC procedures for compression fittings.	01/17/86
1240.12	OC/BHA	Establish OC craft training and certification program for installation and re-make of compression fittings.	01/31/86
1240.13	OC/QA	Establish OC QA surveillance inspection program.	02/14/86
1240.14	OC/ELB	Train OC inspectors on requirements of new specifications and procedures.	02/21/86
1240.15	OC/TRB	Perform inspection of compression fittings and drain valve retaining nuts on Unit 2 drain and vent lines for radioactive systems.	04/15/86

TENNESSEE VALLEY AUTHORITY
KNOXVILLE, TENNESSEE 37902
200 Liberty Building

March 26, 1982

Mr. J. W. Merritt, President
Tennessee Valley Trades and Labor Council
301 W. Vine Avenue
Knoxville, Tennessee 37902

Mr. Roscoe W. Jones, Vice President
Tennessee Valley Trades and Labor Council
3512-Sprucewood Road
Knoxville, Tennessee 37921

Mr. M. C. Hargett, Secretary
Tennessee Valley Trades and Labor Council
5700 Brainerd Road, Room 214
Chattanooga, Tennessee 37411

Gentlemen:

Enclosed is a list of TVA construction projects with the numbers of trades and labor journeymen now employed. Note that some of the projects are now in position to requisition a few people in the unskilled category agreed upon in the Spring meetings. This is to notify you and all other Council members that the projects will begin issuing requisitions on March 29 and will continue thereafter as job needs dictate.

I am also enclosing a copy of a memo from Horace H. Mull, Manager of Construction, to all Project Managers in which he listed each craft with the titles as requested. This should help keep all projects consistent with the Agreement.

Very truly yours,

L. A. Wilson
Director of Labor Relations

Enclosures
cc (Enclosures):
Mr. Clyde R. Caldwell, Jr.
Mr. Ernest Drake
Mr. George Henegar
Mr. C. M. Lank
Mr. Carl Lansden
Mr. James Love, Sr.
Mr. H. A. McClendon
Mr. Roscoe I. Pickrell
Mr. Louis Turner, Jr.
Mr. James O. Tuten

An Equal Opportunity Employer

REQUEST FOR REPORTABILITY EVALUATION

D. This deficiency represents a significant deficiency in construction of or significant damage to a structure, system or component which will require extensive evaluation, extensive redesign, or extensive repair to meet the criteria and bases stated in the safety analysis report or construction permit or to otherwise establish the adequacy of the structure, system, or component to perform its intended safety function.
No __X__ Yes _____ If Yes, Explain: _____

_____

_____

OR

E. This deficiency represents a significant deviation from the performance specifications which will require extensive evaluation, extensive redesign, or extensive repair to establish the adequacy of the structure, system, or component to perform its intended safety function.
No __X__ Yes _____ If Yes, Explain: _____

_____

_____

IF ITEM 4A, AND 4B OR 4C OR 4D OR 4E ARE MARKED "YES", IMMEDIATELY HAND-CARRY THIS REQUEST AND SUPPORTING DOCUMENTATION TO NSRS.

This Condition was Identified by: O F Thies — ERT Group Manager — 365-4464 Phone Ext.

O F Thies for — ERT Project Manager — 365-4414 Phone Ext.

Acknowledgment of receipt by NSRS

Bruce L. Siffen — Signed — Date 1-29-86 — Time 07:59

ERT Form M

WBNP-QCI-1.11-1 R2
Attachment A
(front)

TO : Training Office, Watts Bar Nuclear Plant CONST

FROM : G. B. Lubinski, Supervisor, EEU-A, Watts Bar Nuclear Plant QC

DATE : 12-30-85

SUBJECT: WATTS BAR NUCLEAR PLANT, QUALITY ASSURANCE TRAINING

I. The following persons have completed 1/2 hours of self study/group instruction/practical application (circle one) in NSAS INVESTIGATION REPORTS NOS. I-85-524-WBN AND I-85-9

Instructor

II. Signature	Please Type Name as on payroll	Please Type Social Security No.	Please Type Badge No. Craft	ASP only Sch. & Grade
	MARCO A. ALAS	[redacted]	EEU-A	SC-2
	ROBERT L. BALDWIN	[redacted]	EEU-A	SE-6
	MICHAEL J. DELISLE	[redacted]	EEU-A	SE-6
	JEFFREY B. FAWCETT	[redacted]	EEU-A	SC-3
	KENNETH S. FRAZIER	[redacted]	EEU-A	SE-6
	D. HARNEY	[redacted]	EEU-A	SE-6
	M. HEMPHILL	[redacted]	EEU-A	SE-6
	RONALD C. HUFFER	[redacted]	EEU-A	SE-6
	B. LONG	[redacted]	EEU-A	SE-6
	THOMAS E. MILLER	[redacted]	EEU-A	SE-5
	E. R. NELSON	[redacted]	EEU-A	SC-3

cc: Unit/Craft files
P&T Unit

Supervisor

TRAINING OFFICE USE ONLY

	COURSE CODE	REV.	ADD.	EFFECTIVE DATE	MANHOURS	TRAVEL & PER DIEM	TUITION
11	13	22	24	26	40	46	51

DETAILS, continued

V. CLARIFICATION OF CONCERN, continued

A. 2. continued

This aspect of the Concern involves the 50-ft wide area between the south end of the Trench B and the westerly face of the IPS and Sheet Pile wall.

The Concern indicates that:

a. There is a questionable "gap" between Trench B and the IPS, i.e., the soil or backfill between the features is in question.

b. The US NRC is not aware of this questionable "gap".

c. CONST/QC was told to not issue a Nonconforming Condition Report (NCR) regarding the questionable "gap".

3. Third Aspect of the Concern :

"Around the trench edge and gap between trench and Intake water seems to well up when the pond is at its normal level."

This aspect of the Concern involves the same area identified in A.2, above.

The Concern indicates that:

a. There is underground water percolation or seepage at the surface of the ground in the area between Trench B and the IPS.

b. This water percolation or seepage occurs when the adjacent Yard Drainage Holding Pond is at "normal" water level.

B. Additionally, the Concern states:

"This is a problem because the reason for building the underground dams was to keep sand under and around Intake from "liquefying" during an earthquake."

DETAILS, continued

VI. FINDINGS, continued

B. 2. a. continued

"Type A fills shall be used for all backfill around all building walls, except as noted, or as specified on 41N200-1."

b. Drawing 41N200-1, "Concrete General Outline Features", Note 9 states: (in part):

"...Backfill against other substructure walls shall be clay fill placed in not more than 6" layers and compacted to 95 percent of the maximum standard Proctor density at optimum moisture content, except as noted otherwise."

c. For the IPS, and associated sheet pile wall, no exception was found to the above requirements for backfill. However, the drawings do not show the bounds or dimensions for backfill around the structure.

3. Design Drawing for Trench B:

A design drawing issued for construction of the Underground Barriers (Trench A&B) shows a cross-section of the area between Trench B and the IPS, and contains a Note that allowed (but does not mandate) the installation of a Cut-Off or Tie-in feature. However, this drawing does not contain quantitative criteria for installation of such a feature, and permits verbal (oral) instruction for the work which "may" be performed "to assure adequate cutoff of potentially liquefiable sands."

a. Drawing 10N213-1 shows this 50-ft (min) wide area. Section B1-B1 & C1-C1 of this drawing is a cross-section of this area, and has the following Note regarding the 50-ft dimension:

"Note A1: This may be reduced per verbal instruction from CEB and ENDES design project engineers to assure adequate cutoff of potentially liquefiable sands."

ATTACHMENT D
I-85-442-X13

CONCERN NO: WI-85-040-004 (Milestone 2)

CONCERN: The ERCW pipe lines were not constructed on the natural shale bed as the required base support. The sand, within 10-15 feet of the shale, was no excavated. The base support of these pipes is silty sand. In a seismic event, the sand could potentially liquefy and leave the pipes unsupported which could cause the rupture of the pipes and cut-off the water supply to the reactors.

INVESTIGATION
PERFORMED BY: J. T. Nation

DETAILS

This Concern is substantiated.

The above Concern statement only provides background information regarding the condition that promoted the construction of Underground Barriers (trenches A and B) to contain the potentially liquefiable sand below the Essential Raw Cooling Water (ERCW) pipelines.

The actual Concern involves the Trench B (Underground Barrier) and the 50-ft wide area or zone between the southerly end of Trench B and the westerly face of the Intake Pumping Station (IPS) sheet pile wall, as shown on Drawing 10N213-1 and -2. The Concern has two aspects:

1. The use of 1075 material, and the compaction of that material, for backfill for Trench B and the cut-off trench in the 50-ft wide zone between Trench B and the IPS.

2. A "gap" of silty sand left in the "cut-off" trench in the 50-ft wide zone between Trench B and the IPS.

This Concern is addressed in ERT Investigation Report No. IN-85-442-X13; refer to Clarification of Concern, Section V.A, First and Second Aspect of the Concern in the Report.